HAWAII HIGH TECHNOLOGY DEVELOPMENT PLAN

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

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Warm Personal Regards,
George R. Ariyoshi

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SEPTEMBER 1, 1981

This study was prepared for the State of Hawaii Department of Planning and Economic Development by MPi Marketing Research, Inc. The study contract cost: $60,000.

This report has been catalogued as follows:

Hawaii. Department of Planning and Economic Development
Hawaii High Technology Development Plan.
Honolulu: Dept. of Planning and Economic Development,
State of Hawaii, 1981.

1. Electronic industries-Hawaii. 2. Electronics-Hawaii.
I. MPi Marketing Research, Inc.
II. Title
HD9705.H3M64

EXECUTIVE CHAMBERS

HONOLULU

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FOREWORD

For many years, Hawaii has depended on tourism, Federal expenditures, sugar, and pineapple as the four basic pillars of its economy. But recent economic trends have shown us how dangerous it is to have so limited a productive base. The oil crisis and its effect on tourism; the radical changes now going on in Federal funding policies; and the complex marketing problems of sugar and pineapple have shown us that severe disruption can occur in one or more of these four economic pillars. We have seen for some years the need for major diversification of our economy, and we have worked hard to bring about such change.

We have expanded our agricultural product lines; we have developed, and continue to develop, new energy resources as basic to encouraging new industries to settle here; we have increased our foreign trade activities; our goals for our garment industry have been expanded; we have established an entirely new aquaculture industry; we have encouraged small and diverse new businesses; and we have begun an intensive new campaign to develop high technology industry in the Islands.

This new volume, published by our State Department of Planning and Economic Development, analyzes the world-wide high technology industry and Hawaii's opportunities and problems in relation to it. It also proposes a strategy for development of such an industry in our Islands. Hawaii's exceptional attributes favorable to this industry are well presented.

This report merits reading by all who want to see Hawaii prosper while retaining its uniquely beautiful physical and social environments.

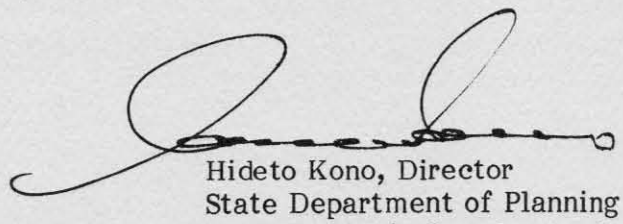
George R. Ariyoshi

PREFACE

This new report is one of many State projects related to one of the most basic of Hawaii's documents, The Hawaii State Plan. That plan outlines types of industries ideally suited to Hawaii's needs and capable of development here in the Islands. This Hawaii High Technology Development Plan shows why high technology industry is one of those types of industries, and what Hawaii should do to establish it here. Thus, the report is a logical response to a need expressed by Hawaii's people in the State Plan.

It is important that a report of this nature be given widespread distribution and attention, so that the practicality of its findings might be thoroughly discussed. Such studies are not prepared to become history books on a shelf; rather, they are compiled to promote positive action of practical benefit to Hawaii. Throughout the report there are suggested policies, proposed strategies, and a variety of recommendations. These policies, strategies, and recommendations should not be considered statements of official policy of the State Department of Planning and Economic Development; such State Administration policies are established by more formal means.

There is little doubt that Hawaii needs economic diversification. There is little doubt that diversification is possible. But there is great doubt that diversification will occur automatically. It is up to all concerned citizens to work toward achieving the State's diversification goal, at least by obtaining a better understanding of the potentials, problems, pitfalls, and ultimate benefits of such industrial change and expansion. This volume will help all who read it to better understand what economic diversification means for Hawaii, and how a high technology industry can bring myriad benefits to our Islands.



Hideto Kono, Director
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ABSTRACT

High Technology industry is suitable for Hawaii because: (1) high technology products have a high value per weight and volume, (2) their manufacture requires few indigenous natural resources, (3) the industry is non-polluting, and (4) Hawaii has a skilled, stable technical labor force which can be augmented by former residents who have unwillingly left Hawaii to seek technical employment opportunities on the U.S. Mainland.

The impediments to the development of this industry in Hawaii include (1) land availability, (2) lack of supporting infrastructure, (3) lack of venture capital, (4) certain features of the Hawaii's manufacturing tax structure that act as a disincentive for the location of manufacturing facilities in the State, and (5) a perception overseas that Hawaii is anti-growth and is strictly a resort destination.

In order to overcome these impediments to high technology industry development it is recommended that Hawaii (1) make sufficient industrial land available to support the growth of the industry, (2) form a high-level organization to coordinate industry development, (3) make certain revisions in Hawaii's manufacturing tax structure, (4) establish a State-supported venture capital fund to aid the local high technology industry, (5) establish a Technical Labor Pool reporting system to remain in contact with former Hawaii engineers and scientists currently working on the Mainland and elsewhere, and (6) conduct an aggressive, sophisticated personal contact and promotional campaign in industry centers to attract expanding firms to Hawaii. The cost of undertaking this program will be $128,960 in the first year and $139,000 in the second year.

Hawaii's high technology opportunities include: (1) local "homegrown" industry; (2) Mainland manufacturers and large scale R&D activities; (3) Japanese manufacturers and large scale R&D activities; and (4) small scale research and development.

A local education program is necessary to inform Hawaii residents of the need for the development of high technology enterprises and the effect this industry will have on the economy, the environment, and the way of life of the average citizen.

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EXECUTIVE SUMMARY

Introduction

Government in Hawaii has long recognized the need to expand and diversify the State's economic base while preserving and protecting its unique environment and quality of life. Currently, the State's economy is based upon four major export industries -- Federal government expenditures, tourism, sugar, and pineapple.

To insure future economic vitality it will be necessary to maintain the growth of existing industries, and to establish new income and job creating activities. The Hawaii State Plan recognizes and sets forth the characteristics of industries which are ideal to support economic diversification in Hawaii:

> High growth potential, to absorb a part of the 31,000 people unemployed in the State and to take advantage of Hawaii's high productivity and labor force stability.
>
> Environmental cleanliness, so as to protect the unique beauty and balance of nature in the Islands and the surrounding waters.
>
> Industries producing high value/low unit-mass items, so that shipment from Hawaii to the Mainland is an insignificant cost factor, or engaged in research and development which require excellent air transport and communications facilities.
>
> Industries finding Hawaii's strategic position in the Pacific Basin an advantage for export -- conversely, a suitable industry may also decrease imports, rendering the State more self-reliant.

The microelectronics high technology industry involving the production of, research into, and application of large-scale integrated circuits and microprocessors has been identified as highly suitable for location in Hawaii. This high technology industry presents a considerable opportunity for Hawaii to diversify its economy, provide employment for its university graduates in technical fields and contribute to Hawaii's goal of becoming a center for research and technological activity in the Pacific.

Hawaii, however, is in competition with many other areas which also view this industry as the kind they would like in their own communities. It is the fastest growing industry in the United States and is expected to achieve sales of some $300 billion to $400 billion in 10 years. This industry is fast growing and its establishment promises to absorb an increasing portion of the unemployed. It must move somewhere. In the United States, expanding companies must move due to labor shortages in their traditional growth areas. In Japan, companies are beginning to locate new facilities away from the home islands to obtain more favorable tariff and currency exchange rates. It is non-polluting; thus, the State maintains its unique quality-of-life and environment. It is vulnerable to what Hawaii has to offer; to U.S. companies: labor, a stable, productive, available labor force, a place engineers want to live; to Japanese companies: a familiar location which opens the door to their largest market, the United States.

The high technology electronics industry thus has the characteristics to take maximum advantage of what Hawaii has to offer, and will offer Hawaii the maximum possible advantage for its investment, in labor, land, water, and capital.

The Benefits of High Technology Electronics for Hawaii

If Hawaii is successful in encouraging the electronics industry to develop here, the State will receive many benefits:

A vitally necessary diversification of Hawaii's economy.

Amplification of and support for Hawaii's efforts to become a center for Pacific scientific and technological development.

Expansion of the University of Hawaii's research capability, support for the scientific community, and enhancement of the intellectual environment in Hawaii in such fields as electronics, physics, and chemistry.

Employment opportunities for University of Hawaii electrical engineering graduates, more than 95% of whom now have to leave the State to seek employment elsewhere.

The attraction of former Hawaii residents who are now working in the electronics industry on the Mainland and would like to return.

Provision of environmentally and aesthetically desireable, industry growth that fits well with Hawaii's growth concept.

Employment for technicians, production workers, and jobs in supporting facilities and services, such as accountants, personnel specialists, and facilities support workers.

A positive economic ripple effect stimulating the establishment of infrastructure to supply parts, fabrication support, equipment, and repair services.

Stimulation of the economy through the multiplier effect caused by increased personal income, which will create many other jobs in other sectors of Hawaii's economy.

The beneficial effect of introducing this industry to Hawaii was expressed at a local electronics industry seminar, and was reported by the Department of Planning and Economic Development (DPED) in the report, Expanding Hawaii's Electronics Industry.

> . . . it was conservatively estimated that 1,000 jobs and $50 million in annual sales revenues could be generated within the next five years. Of these 1,000 jobs, approximately 700 would be for engineers, skilled assemblers, and technicians. Employment opportunities would be provided for the 70 electrical engineers graduating from the University of Hawaii each year . . . 1,000 direct jobs in the electronics industry would generate

an additional 1,800 indirect jobs in other industry sectors. Also, because of this multiplier effect, the $50 million in sales would result in about $65 million in additional revenue to the economy . . . The projected economic activity of $50 million in sales and 1,000 jobs would result in at least $1,000,000 per year in additional State tax revenues.

The recent explosive growth in the industry renders these estimates conservative; the current prospects are even more encouraging.

Hawaii's Advantages for High Technology Industry

Hawaii has numerous attributes which will aid in its efforts to develop the desirable type of high technology industry described above including:

Electronics engineers from the University of Hawaii are available, and experienced electronics engineers now working in the industry on the Mainland would like to return to Hawaii.

Hawaii has a productive work force including a large number of multi-lingual Asian and Pacific immigrants, and trained people who formerly worked in the electronics industry on the Mainland now reside in Hawaii and are employed in other occupations.

Hawaii is close to Asia and the Pacific, and understands the nuances of doing business in the Pacific and the Orient.

Communications systems with the Far East and the Mainland United States allow for telephone communications in the morning to the East Coast, and in the afternoon to Asia and the Pacific.

Frequent air-cargo and passenger transportation is available to the Mainland, to Asia, and the Pacific.

Hawaii's beauty and its world-renowned climate are attractions for engineers and scientists, and the cleanest water and air in the United States make Hawaii a preferred place to live.

Adequate electrical power is available well into the future; Hawaii is developing its alternate energy resources more rapidly than any other State in the Union. Considerable potential for the early development for geothermal power exists; the possibility of transmitting this power between the Islands is being investigated, and the State has made great strides in wind energy and ocean thermal energy resources development.

The University of Hawaii -- an excellent school with a distinguished faculty in various scientific and technological disciplines. The U.H. ranks high as a recipient of research grants.

Hawaii's deep ocean near-shore, provides opportunities for naval underwater research activities, and supports the development of ocean thermal energy resources.

Hawaii has very low background radio noise which makes it feasible to link computers and terminals by radio, and makes the transmission of information more reliable and efficient in Hawaii than in other areas of the United States.

Hawaii has extremely clear air and tall mountains which attract astronomical research activity from all over the world to the top of Maunakea on the Big Island as well as to Haleakala on Maui.

In summary, the key attributes that differentiate Hawaii from competitive areas on the U.S. Mainland and in foreign countries are:

Hawaii has an available, highly-productive technical labor force in place which could be swelled by ex-Hawaii engineers who were forced to go to the Mainland to work and want to return.

Hawaii is a uniquely beautiful place where scientific/engineering people want to live and work.

Hawaii is strategically located with a highly sophisticated transportation and communications network for easy accessibility from the United States and Pacific Basin.

Hawaii has an established scientific community with leadership in agri/aquaculture, energy, and astronomy.

There are myriad other advantages, such as the East-West Center, Foreign-Trade Zone Number 9, the Hawaii Institute of Electronics Research -- to name just three.

Impediments to Development

Impediments which stand in the way of Hawaii's developing high technology industry, and which will be discussed at length in subsequent sections of this Stategic Plan include:

Land availability - there is insufficient suitably zoned land available on Oahu to support the needs of electronics manufacturing enterprises, many of which typically need between 10 and 25 acres for their operations.

Water availability - water permits are necessary for the development of land in areas most likely for the development of the industry.

An image of being anti-growth - Hawaii's emphasis on preferred growth has been misreported and misinterpreted so that many electronics executives believe that Hawaii does not want economic growth.

An image of being strictly a resort area - there is a problem of overcoming the image of Hawaii as being "only a tourist destination" and unsuited for high technology industry.

Hawaii's high cost of living - the costs of living and doing business in Hawaii are significantly higher than competing areas such as Oregon, Colorado, New Mexico, and Texas.

Lack of infrastructure to support an electronics industry - many components have to be shipped in. It will be necessary to have some fabrication done on the Mainland until supporting infrastructure is developed to assist the growth of the industry.

Taxes - Hawaii has some taxes which inhibit the development of electronics and other high technology activity in the Islands. Hawaii is not competitive in offering tax and other locational incentives in support of new business, as do many competing areas.

In order to overcome or minimize the impediments to Hawaii's development of high technology industry, the following actions are recommended:

Provide for the rezoning of land for high technology industry in at least two areas on Oahu for the establishment of a High Technology Industrial Park. Such rezoning from agricultural use to high technology use should be in a minimum increment of 300 acres per area with surrounding land available for expansion in the future.

Give high priority to the high technology industry in the provision of water permits in water control areas.

Negative images of being anti-growth and strictly a resort recreational area should be overcome through advertising and promotional campaigns, particularly in trade and selected business publications.

Hawaii must organize a coordinated, aggressive, and long-term personal contact effort with electronics firms, primarily in the Silicon Valley but also in other parts of the Mainland United States and in Japan.

As a part of the effort a promotional and advertising campaign must be undertaken to support the personal contact efforts.

Hawaii should seriously consider eliminating the use tax for high technology equipment purchased on the Mainland or elsewhere for use in Hawaii high technology manufacturing. Hawaii should also consider eliminating the 0.5% excise tax on high technology manufacturing.

The State Government should establish a venture capital fund to assist small and medium size "homegrown" firms in expanding, and to assist high technology firms which wish to locate in Hawaii in obtaining adequate capital.

The State should monitor the incentives offered by other areas to develop high technology industry. If it is determined that such incentives would make the difference in overcoming some of the impediments to the growth of the industry, Hawaii should consider establishing an incentives program directed specifically at high technology operations.

Hawaii should establish regularly updated Technical Labor Pool reporting as an aid to companies who want to recruit for their Hawaii facilities.

Organization

In order to overcome the image that the State is anti-growth and is strictly a resort center, and to insure that targeted companies realize Hawaii is serious in its efforts to develop high technology industry, it would be helpful to have the Governor of Hawaii closely identified with the State's efforts to develop the high technology industry.

A High Technology Advisory Group (HTAG) should be organized to advise the State in the industry development effort. The basic responsibilities of the HTAG would be promotional and developmental in nature.

Members could include Hawaii landowners who are interested in providing land for high technology development; Government officials who are closely connected with the high technology industry, and individuals who have participated in past efforts to develop high technology industry in Hawaii.

Promotional Activities

During the initial period before the industry has become firmly established, the State of Hawaii should provide adequate funding for an aggressive promotional program.

The promotional effort would be concentrated in the Silicon Valley in California; a secondary effort should be directed at Japanese companies. Hawaii's strategy should be to seek the expansions of growing companies from each area.

It is important to establish an early relationship with these companies to be aware of their plans and to assist them by providing information and other assistance, so that Hawaii is in its best possible position when the expansion takes place.

A systematic personal contact effort should be established with both government officials and private industry representatives making personal contacts in a team approach. When serious interest is developed, top State officials should be utilized in contacts with executives of the interested organization.

The chart on the facing page graphically summarizes the effort to develop a high technology industry in Hawaii.

Hawaii's Markets include: (a) small scale research and development activities - this is comprised of small teams of engineers and scientists working on a specific problem or opportunity utilizing existing office space and transmitting technical information through computers to the Mainland; (b) "homegrown" industry development - providing local entrepreneurs with financial assistance (venture capital and low interest rate loans) and technical assistance to encourage them to establish their own high technology operations within the State; (c) Mainland manufacturers - the attraction of expansions of Mainland manufacturers and large-scale research and development organizations to the State of Hawaii through the development of a high technology industrial park; and (d) Japanese manufacturers - the attraction of similar firms from Japan.

HIGH TECHNOLOGY DEVELOPMENT EFFORT

1. MARKETS

- RESEARCH AND DEVELOPMENT
- "HOMEGROWN" INDUSTRY
- MAINLAND MANUFACTURERS
- JAPANESE MANUFACTURERS

2. KEY ELEMENTS

- HIGH-TECHNOLOGY PARK DEVELOPMENT
- VENTURE CAPITAL & FINANCIAL ASSISTANCE
- LABOR AVAILABILITY AND TRAINING
- INFRASTRUCTURE DEVELOPMENT

3. PROGRAMS

- PROMOTIONAL PROGRAM
- LEGISLATIVE PROGRAM
- MONITORING PROGRAM
- LOCAL EDUCATION PROGRAM

The Key elements include: (a) development of high technology industrial parks for larger manufacturing operations and large-scale research and development activities; (b) the development of venture capital and financial and technical assistance programs to help local residents initiate high technology companies, and to assist existing firms to grow; (c) labor availability and training - a continuous survey of available engineers and technicians both in Hawaii and former residents who wish to return should be initiated. Technical training programs in the Community Colleges and technical education at the University of Hawaii-Manoa should be expanded to meet the needs of locally based high technology industry; (d) infrastructure development - encourage the development of supporting fabrication and wholesale parts distribution through existing and proposed State financial assistance programs.

Programs include: (a) a promotional program - a modest scale effort increasing in size and intensity as high technology parks become available and coordinated with private efforts; (b) legislative programs to eliminate disincentives in tax structure and to provide adequate promotional funding; (c) a program to monitor the efforts of other areas to help Hawaii remain competitive in attracting high technology companies; (d) local education programs to inform local citizens of the efforts to develop high technology industries in Hawaii and of the benefits that industry growth will bring to the State.

SITUATION ANALYSIS:
WORLDWIDE HIGH TECHNOLOGY INDUSTRY

Introduction, Background and Definitions

The term "high technology electronics" encompasses such a broad spectrum of functions, processes and facilities that a working definition should be noted before proceeding. This plan is primarily concerned with the development of the following types of activities in Hawaii: micro-electronics research and development, the manufacture of high density integrated circuits and microprocessors, and the design and assembly of other high-value, low-mass finished items which utilize these electronic components. As noted by the Department of Planning and Economic Development (DPED) in its publication, Expanding Hawaii's Electronics Industry:

> Such functions . . . can be located wherever there are good air transportation facilities because of their high-value characteristics.

Items that will not be emphasized are those requiring heavy frames or housings, since shipment over long distances is expensive and may preclude competitive pricing, and manufacturing processes that are especially polluting.

The fastest-growing segment of high technology electronics is centered upon logic chips or integrated circuits -- research and development of new types, and of new applications for existing types, and the manufacture and incorporation of micro-integrated circuits into semi-finished or finished products. The research is intensive and chips are becoming increasingly more complex. For example, starting with the 1K RAM (Random Access Memory) chip in the early seventies, the industry moved to the 4K, 8K, 16K and is in the process of developing the 64K chip. [A 1K chip controls 1,024 bits of information, while a 64K chip controls 65,536 bits.]

Historically, the revolution in chips came in 1971 when Intel Corporation received a large order from a Japanese company for its calculator chips. To meet the order without becoming totally dependent upon a single company, Intel developed a standard microprocessor chip that could be programmed for other customers' uses as well. Since then (with the standard chip) the market has virtually exploded -- reaching $800 million today and expected to reach $2.2 billion in 1985 and $6.0 billion by 1990.

After the U.S. lead was affected for two years by capacity problems, Japanese firms moved into the memory chip segment and garnered 40% of the 16K market. They are expected to take 40 percent to 60 percent of the new 64K memory business. However, the U.S. still retains its strong lead in standard microprocessors and microcomputers, which require software skills that the Japanese have yet to acquire. The Europeans are late-comers, but have made some inroads into the customized microprocessor business. Europe is a major user of U.S. and Japanese chips.

But the business is still in its infancy. In fact, one expert believes that microelectronics is where oil was in 1870. New applications are being found every day, and it is predicted that by 1990:

Microprocessors will hold one million transistors, and each will have the computing power of IBM's current 370 System Computer.

All autos will have microcomputers that will increase fuel efficiency, warn when preventative maintenance is needed and diagnose problems.

One-third of all homes will have computers or terminals.

Most banks will be interconnected through a computer network grid.

Most doctors will have computer-assisted diagnostic equipment in their offices.

Microelectronic implants will be controlling sophisticated new artificial organs and will be assisting in the functioning of impaired natural ones.

In summary, the United States and Japan are the world leaders in microprocessor technology and the growth potential is enormous.

The State of the Business

Currently, international high technology industries that are based upon chips are responding to four dynamic situations. Each alone would have profound positive effects upon Hawaii's plans for developing this industry; combined they serve as an impetus for immediate comprehensive and aggressive action on the part of government.

As has been noted, two countries dominate the field: the United States and Japan. For separate reasons the high technology industry in both countries is being forced to build new research and manufacturing facilities away from traditional locations. Hence, the first two areas of opportunity.

In the United States, expansion of the electronic chip and related high technology industries came in the 1970's and was concentrated in California's Santa Clara County ("The Silicon Valley") and along Route 128 in Massachusetts. The central reasons for the growth of these areas were the proximity of universities (with their technical personnel and resources), the support of local government, and eventually, a small-scale multiplier or critical mass effect wherein manufacturers/research facilities attract supporting companies which in turn attract more manufacturers/research facilities and so forth. Eventually the labor supply is exhausted, and the companies are forced to move or to locate expansion plants away from the mother areas. These moves are generally being made to either established technology parks, such as The Research Triangle Park in North Carolina, or to States that are aggressively trying to attract them, such as Oregon and Colorado. Currently, The Research Triangle Park is bringing in an average of one new company a year, while Oregon has added thousands of new jobs in recent years. But neither the established or new areas seem to have an edge. The key to future growth lies in where the sophisticated labor supply is, and where the engineers and scientists want to live.

Japan has perhaps the strongest economy in the world. It has grown at a very rapid rate since the late 60's. Its government cooperates closely with industry in the international competitive struggle. This partnership arrangement, and the fact that

the United States undertakes much of the responsibility for the military defense of Japan, allows investment capital to be funneled directly into civilian industry rather than into the development of military weapons.

The Japanese have always been an industrious people who have had to sell and buy overseas in order to survive. They have perfected techniques of management and logistical support to sustain far-flung marketing activities for goods manufactured in Japan and sold throughout the world. In 1978, America's gross national product was roughly twice that of Japan's, but since the United States population is about twice as big as Japan's, the per capita gross national product in Japan was about equal to the that of the United States. By 1978, however, the value of industrial production in Japan was already 3/4 that of the United States or about 1.5 times the U.S. per capita value of industrial production.

In 1978, Japan had a favorable balance of trade of some $76 billion while the U.S. had a deficit balance of trade of some $5 billion. Further, the rate of capital accumulation in Japan is much greater than that in the United States. Japan's personal savings rate is now about 24 percent while that in the U.S. has now declined to about 4 percent. This allows for a tremendous capital accumulation which can go directly into new industrial enterprise, modernization of plants, automation, and into the new field in which Japan is now emerging as the world leader: robot industrial manufacturing.

In 1973, the average industrial plant in Japan was more modern than that of the United States in terms of plant and equipment, and the gap is increasing. The U.S. had enjoyed a substantial lead over Japan in research and development expenditure as compared to the gross national product. In 1961, U.S. research and development expenditures were 2.74 percent of GNP, about twice Japan's rate of 1.39 percent. By 1974, the American rate had fallen to 2.32 percent and the Japanese had risen to 1.95 percent. The American rate since 1974 has continued to fall, but the Japanese rate has risen.

The Japanese gross national product grows an average of about 5 - 6 percent per year while in the U.S. it grows about 2 - 3 percent annually. In absolute terms, Japanese capital investment also grows more rapidly than ours. By 1978, Japan's investment in new plant and equipment was already equal to America's in absolute terms or about twice our per capita rate. Further, Japan's investment is concentrated in areas with significant potential for future growth.

The Japanese Government and industry have planned and made major investments aimed at achieving dominance in the manufacture of advanced semiconductor devices. The technical innovation and financial commitment necessary to achieve this goal was encouraged by the Japanese Government, and allowed Japan to develop the next generation of advanced memory chips. Capacity limitations in the U.S., which took two years to overcome and caused international shortages, opened the door to these Japanese efforts.

U.S. producers are concerned that well-organized teams from Japan are gearing up to produce 64K RAM memory chips. Fujitsu, Ltd. was the first company anywhere to field a 64K RAM. The Asian leaders now include Nippon Electric Company (NEC) and Hitachi, Ltd. according to Nomura Research Institute. In addition, Toshiba, Mitsubishi, Matsushita, and Oki are distributing samples, and

Sharp Corporation and Sanyo Electric Company indicate that they also plan to produce 64Ks. NEC already has developed the capacity for volume shipments of these devices.

In addition to getting into the market early, many of the Asian contenders plan to produce their devices in the U.S. NEC, for example, purchased Electronic Arrays, Inc. of Mountain View, California, to give it a U.S. manufacturing base. Fujitsu is building a plant in San Diego and Hitachi has set up assembly and test facilities in Dallas. In April of 1980, Toshiba acquired Maruman Integrated Circuit Company, the California affiliate of Banser Kogyo KK, a Japanese electronics concern. The purpose of the acquisition was to establish a base for U.S. semiconductor production. Toshiba will invest the equivalent of $24 million in the U.S. company, which will be renamed Toshiba Semiconductor, U.S.A. Production capacity will be expanded from the current 500,000 circuits to 2 million units annually by the end of 1982.

The Japanese electronics companies are backed up by a five-year multi-million dollar government research effort. A recent study by a British semiconductor consulting group reports that it is entirely possible that the Japanese could achieve parity in advanced semiconductors with the U.S. by the end of the 1980's. Soon after, the Japanese may well be predominant.

Growing strength in semiconductor design and manufacture will deliver to Japan the means for realizing its cherished goal of becoming a world leader in computers. Research involving the very-large-scale integrated circuit (VLSI) is a computer project rather than a semiconductor project to the Japanese. Data processing, telecommunications and industrial controls are clearly the industries of the future. Preeminence in these industries would give the Japanese the same industrial dominance that steel gave the U.S. in the first half of this century. The semiconductor is the building block upon which other industries grow.

The U.S., on the other hand, is lending little assistance to its semiconductor manufacturers to prevent the semiconductor industry from going the way of steel, television and textiles. Charles E. Sporck, National Semiconductor Corporation President and CEO, has been quoted as saying, "Japanese companies intend to dominate the U.S. semiconductor industry just as similar efforts have overtaken many other American industries. Without U.S. Government assistance and some changes in the way the Japanese play the game, the semiconductor industry will be overrun and destroyed within 10 years." Robert Noyce, co-founder of Intel, Corp., has said, "We can no longer afford not to see this as a national defense issue."

There is little question that the Japanese perceive the computer industry as the watershed competitive area of the 1980's just as steel was in the 1960's. It is a Japanese national policy objective of the highest priority to become the industry's global leader. Leadership in computers combined with the country's other competitive advantages would assure Japan's economic leadership well into the next century. Thus, the Japanese emphasis on microprocessor technology. Their effort will lead to the development of the next generation of electrical and electronic products which will be heavily dependent upon microprocessors. In addition, the incorporation of those technologies into other areas of Japan's industrial system will make it even more productive.

Japan's Government recognizes the potential in these trends and provides incentives for industries moving to take advantage of them. It supports the development of highly productive high technology industry and deemphasizes low productivity industry, encouraging the relocation of these to foreign countries, while keeping at home the more productive type of activity.

The result of all this is that the world can expect that Japan will become the dominant factor in the electronics industry while the U.S. struggles to maintain the growth rate of its existing high technology industries.

The increasing furor over Japanese exports into the U.S. (which are believed to weaken American industries such as the automobile, television, steel, and now the semiconductor industry) will mean an increasing trend by Japanese companies to invest in the U.S. in order to overcome this criticism and to seek to prevent tariff and other limitations on their exports into the United States.

For example, to support sales in the European Economic Community and the United States, the Nippon Electric Company is expanding a plant in Ireland, building another in Scotland, and, as stated, has purchased facilities in Mountain View, California. Likewise, Hitachi has plants in West Germany and Texas, and Fujitsu is building in Ireland and, as mentioned previously, in San Diego, California.

The European companies, which have garnered an impressive share of the custom microprocessor business, have been in an undesirable currency exchange situation with the United States. It would also be advantageous for these companies -- especially in the United Kingdom and West Germany -- to build facilities in the United States.

Finally, there is market growth. The market is expected to move from the current $800 million level to $6 billion by 1990. This growth will move hand in hand with increased uses of microprocessors which will touch nearly every aspect of our human life and business. The potential growth, in and of itself, would warrant the effort to develop the microelectronics industry. But when the growth is combined with the fact that the industry must move from its home areas in the United States and Japan, and wants to move from Europe, the attraction of the industry is greatly enhanced.

In summary, the need and desire of the industry to relocate facilities and its explosive growth converge to present opportunities for the State of Hawaii.

SITUATION ANALYSIS:
HAWAII'S OPPORTUNITIES AND PROBLEMS

Introduction

State Government in Hawaii has recognized the need to expand and diversify its economic base while preserving and protecting its unique environment and quality of life. Currently, the State's four major export industries -- Federal Government expenditures, tourism, sugar, and pineapple -- are all expected to show less than adequate growth in the future.

Prospects for sugarcane production indicate no expansion of existing acreage or possible declines, increased tonnage from higher yields, but constant or decreasing employment in the industry. Pineapple cannery operations have been decreasing in recent years along with pineapple cultivation. However, these trends may accelerate due to nematode infestation in many fields. The bane will probably go unchecked since the Federal Government has restricted the use of a highly effective nematode killing insecticide.

In real terms, Federal defense expenditures in Hawaii decreased $45 million from 1975 to 1979. Federal civilian employment fell from 29,700 to 28,500 over the same period. Increasing air travel costs, the previous development of desirable resort sites, environmental constraints, and the recent drop in visitor arrivals cloud the future of the visitor industry in Hawaii.

To insure future economic vitality it will be necessary to maintain growth of these established industries and to establish new business activities. As recognized by the State Government, ideal industries for diversification are those:

> With high growth potential to absorb a part of the 31,000 people unemployed in the State and to take advantage of the high productivity and labor force stability.
>
> Generally non-polluting so as to protect the unique beauty and balance of nature in the Islands and the surrounding waters.
>
> Producing either high value/low unit-mass items so that shipment from Hawaii to the Mainland is an insignificant cost factor, or engaged in research and development activities which require excellent air transport and communications facilities.
>
> Which find Hawaii's strategic position in the Pacific Basin an advantage for export. Conversely, a suitable industry may also decrease imports, rendering the State more self-reliant.

Of course, the high technology electronics industry meets the above criteria -- especially companies engaged in the production of, research into, and applications of microintegrated circuits or chips.

Hawaii's Advantages for High Technology Industry

Obviously, the high technology electronics industry is attractive to any state. But Hawaii offers benefits to the industry that differentiate it from the competition.

Scientific Labor Force

Hawaii's engineering labor force is comprised of two groups: first, those already in the State including about 70 electrical engineers who graduate from the University of Hawaii each year; second, many of the past graduates and residents who have had to move to the Mainland to find work and would like to return.

The DPED recently conducted an informal survey of University of Hawaii graduate engineers working on the Mainland. One hundred and four questionnaires were mailed and 50 responses were received. Of the 50, forty-nine said that they would return to Hawaii if employment in the electronics field were available; 27 of the respondents said they would return within six months.

Production Line Labor Force

There are three key elements in this segment of the State's labor force: availability, productivity, and loyalty. In addition to the unemployed, which number more than 30,000, Expanding Hawaii's Electronics Industry reported that:

> . . . there is a sizable number of workers with Mainland or Far East production experience currently living in Hawaii, but unable to find work in the industry.

Businessmen with experience in the Far East, as well as Hawaii, feel that the Hawaii workers are at least as productive as their Asian counterparts. This is certainly the opinion of the President of Honma Company of Japan, a sporting goods enterprise which manufactures top-of-the-line golf clubs in Hawaii.

In terms of turnover, Expanding Hawaii's Electronics Industry observed that:

> With only a 1 percent annual quit rate, Hawaii's workers are shown to be industrious and loyal.

Two additional aspects of the Hawaii work force that are noteworthy concern its demographic composition -- the willingness of its women to work and the high percentage of women of Asian ancestry in the labor force. Expanding Hawaii's Electronics Industry reported that:

> Women are the backbone of the industry's production work force. Hawaii has a long-standing tradition of women working, with the highest percentage of working women in the Nation.
>
> The ability of Asian women to produce high-quality electronic equipment is well known. Hawaii's work force contains a significant number of persons of Asian cultural background, traditions, and skills.

It should be noted that labor -- scientific/engineering as well as production line -- is the single largest problem facing the microelectronics industry in the United States. Labor shortages are forcing the industry to move from traditional locations to places where engineers prefer to live. Therefore, complementing Hawaii's labor force advantages, is its unique physical environment.

Strategic Location

The State is strategically located relative to the Pacific Basin -- a fact long recognized by the military, but ignored by large segments of the business community. The benefits are twofold. First, there is ease of travel and shipment to both the United States and Asia. Second, there is same-working-day communication with the Basin due to time zone congruencies. Hawaii's transportation and import/export industries have become among the most experienced in the world. This benefits industry by increasing business efficiency.

Physical Environment

Hawaii is well known throughout the world for its fertile soil and mild climate. Both allow its tourist industry to thrive and its sugar and pineapple industries to exist. Hawaii is unique among the Sun Belt States, offering a quality of life which could be highly attractive to scientists, engineeers, and technicians engaged in high technology industry elsewhere -- and especially to employers who are finding it difficult to hire and hold these highly trained people. It is a beautiful place to live and ranks very high among the places where scientific personnel want to live. For those engineers who have already left, it is a place to which one would always want to return.

Foreign-Trade Zone Number 9

The existence of Foreign-Trade Zone Number 9 is particularly important to companies engaged in foreign trade because Federal customs laws imposing duties, taxes, quotas, and other requirements relating to imports are not applicable.

East-West Outlook

As the DPED noted in Expanding Hawaii's Electronics Industry:

> Hawaii is a unique blend of Eastern and Western cultures. One tangible expression of this characteristic is the East-West Center . . . [which] promotes better relations and understanding between Asia, the Pacific, and the United States.

Another manifestation of Hawaii's East-West outlook is its multi-lingual community, especially where Asian and Pacific languages are concerned.

Scientific Community

Hawaii already has a scientific community which has assumed leadership roles in agri/aquaculture, energy, and astronomy. In addition to the University, Hawaii supports the Hawaii Institute of Electronics Research, the Institute of Electrical and Electronic Engineers, Inc., the John A. Burns School of Medicine, the Hawaii Institute of Geophysics, the Institute for Astronomy, and the Research Corporation of the University of Hawaii. Scientists prefer to be where other scientists are. Hawaii has an established, cosmopolitan, intellectual and scientific community; a high technology company locating here would not be blazing a new trail into a cultural desert.

The University of Hawaii

The University of Hawaii has played an important role in the development of the State. Since the early 1960's, hundreds of millions of dollars in State funds have been invested in this University to make it a major institution for learning in the Pacific. It has considerable potential for providing the basic and applied research necessary to support high technology industry in Hawaii.

The University of Hawaii at Manoa is the principal campus in the 10-campus, 50,000-student, Statewide UH system. There are some 4,000 graduate students at Manoa, and some 1,500 instructional faculty who devote at least 30 percent of their time to research. It also has some 250 full-time researchers. Total employment at the University of Hawaii Manoa Campus is comprised of 4,600 full-time faculty and staff. In a typical year, Manoa awards 2,500 Bachelors', 1,000 Masters' and 100 Ph.D. degrees. The Manoa campus is the site of all graduate programs and professional schools. Manoa-based expenditures amounted to some $150 million in 1980.

The University of Hawaii at Manoa ranked 30th in 1976 in the receipt of Federal research support throughout the nation. During the period 1979-80, some 360 awards were made for research, amounting to $25.6 million. The National Institute of Health and the National Science Foundation were the sources of some 45 percent of the total awards. Some 54 percent of the research awards go to organized research units.

A significant amount of Federal dollars are awarded to the Manoa Campus of the University of Hawaii for training by virtue of its research strength. A total of 250 training awards were made in 1979-80, valued at $15.2 million. The total of grants for direct research and training was some $40.8 million during the same period.

The Manoa Campus is the base for a number of organized research institutes with Pacific missions, such as the Institute for Astronomy, the Hawaii Institute of Geophysics, the Pacific Biomedical Research Center, the Cancer Center of Hawaii, and the Hawaii Institute of Marine Biology.

Although the University of Hawaii is an extremely strong research institution, it must further improve and strengthen its capabilities for research in the technological disciplines that will support the growth of high technology industry in Hawaii.

Because the University of Hawaii is one of the leading University research institutions in the Nation, its capacity for research support should be made known to targeted companies which the State will be urging to locate in Hawaii.

Electrical Engineering Department

The Electrical Engineering Department is staffed by outstanding professors, many of whom have had extensive experience in large U.S. technological companies. Currently, there are 120 undergraduates and some six graduate students enrolled in electrical engineering at the University of Hawaii. The Electrical Engineering Department is reported to be among the top 10 in the United States and has grown rapidly over the past five years due to the great demand for electrical

engineers. Almost all of the graduates in electrical engineering go to the Mainland United States for employment because of limited employment opportunities in Hawaii.

The Hawaiian Telephone Company has indicated that about 75 electrical engineers' applications on average, are on file for employment with that Company. The State of Hawaii Employment Service reports that there were about 100 persons, whose skills were classified in electrical and electronics engineering, looking for employment during the first quarter of 1980.

The local chapter of the Institute of Electrical and Electronics Engineers indicates that there are some 558 members in the local chapter representing a pool of expertise in all areas of electrical engineering.

Physics Department

The University of Hawaii Physics Department currently has 55 undergraduates and 14 graduate students enrolled. Most graduates also go to the Mainland for work since there are more opportunities there.

According to Dr. David Yount, Chairman of the University of Hawaii Physics Department, there is a pool of young physicists here in Hawaii who have stayed in the State after graduation from the University of Hawaii, even though they could not find jobs in their field. There are 17 highly skilled faculty members in physics at the University of Hawaii who could be called on to consult with industries that move here. These physicists currently do consulting work for Mainland firms.

Chemistry Department

There are 20 undergraduates majoring in chemistry, six in graduate school for Masters' degrees, and 10 studying for Ph.D. degrees. One-third to one-half of these graduates leave for the Mainland upon graduation. As in the case of the Physics and Electrical Engineering Departments, the Chemistry faculty consists of a well-qualified group of experts available for consultation by industry.

Hawaii Technical Labor Pool

Until about six years ago, the State remained in regular contact with scientists, engineers, and technicians who were graduates of the University of Hawaii. The list of these skilled professionals and their current employment situations can be easily updated for recruitment purposes. The availability of scientific labor can act as a locational incentive for the first three or four companies entering the State -- and the benefits of a regularly updated list to industry recruitment efforts is obvious.

We therefore recommend that a Hawaii Technical Labor Pool report be established and updated on a regular basis to aid in the recruitment of ex-Island scientists, engineers, and technicians, and to act as an inducement for companies with labor problems. To the decision-makers in high technology industries, it should be pointed out that engineers currently graduating from the University of Hawaii are available; that many engineers and scientists on the Mainland are in communication with the State and would return if they had the opportunity; and that Hawaii's work force is stable and productive.

The stable work force of engineers and scientists who do not want to leave, or want to come back to Hawaii, is a factor that will generate highly positive attitudes toward the State. The scientific community may also attract scientifically-oriented companies to the State through personal contact and direct mail campaigns. The objective here would be to boost Hawaii's scientific image, through presentation of Hawaii's quality of life and the intellectual stimulation provided by Hawaii's established scientific community and supporting institutions.

Hawaii Institute of Electronics Research (HIER)

The State has shown foresight in establishing the Hawaii Institute of Electronics Research and in taking the leadership and providing funding to assist the Institute in getting started.

The purpose of HIER is to serve as an independent self-supporting research and development center for electronics and related technology. Its prime responsibilities include undertaking basic and applied research and development; pursuing, receiving and administering research and development grants; providing technological leadership and advisory intelligence to locally based designers, consultants, manufacturers and service-oriented companies; providing a reservoir of talent and expertise in high level innovative technology; and conducting seminars, workshops and other activities, all of which are calculated to enhance the expansion of the electronics industry in Hawaii.

Private industry is fully supporting the HIER activity as reflected in its Board of Directors which include the President of the Hawaiian Telephone Company, who also serves as its Chairman; the President of Dillingham Corporation; the President of Hawaii Capital Investment Company; the President of the University of Hawaii; a Vice President of TRW; and others involved in the electronics industry in the State.

HIER has suffered some delay in getting into operation while the search for a suitable person to direct its operations goes on. It has no track record. Consequently, its basic attraction to a suitable candidate for Director is the potential that the State would offer in terms of development in the high technology field which would then result in a similar expansion of HIER and the corresponding responsibilities of the Director.

Delay in hiring a Director may possibly be beneficial to Hawaii, since the State must establish an adequate, aggressive program for the development of the high technology industry along with the supporting research efforts of HIER. HIER can become a very important research organization patterned after the Stanford Research Institute and could be of immense value to the State in the development of a high technology industry.

HIER could act as a funneling agent for the considerable resources of scientific and technical expertise available at the University of Hawaii. After some development, HIER could employ its own research staff along with the continued use of the research capability at the University of Hawaii.

In order for HIER to be successful, it should have a high level Board of Directors. In time, it should be located in an impressive structure which is symbolic of what it is and what it can accomplish. The salary to be paid the Director of HIER would eventually have to be substantial: equal to that of a highly paid executive in the high technology industry.

Private industry in Hawaii must be willing to give full support to the HIER activity, particularly during its initial stages. This should include monetary contributions, as well as contributions of equipment and an appropriate site for its operations. The success of HIER will mean a lot to the community and to Hawaii's potential for expanding high technology business activity by local firms.

Impediments to the Development of High Technology Industry

Lack of Industrially Zoned Land

In December 1975, the State Department of Planning and Economic Development released the publication Kakaako, An Urban Design Demonstration Study which addressed the demand for industrial space on Oahu through 1990. In this study it was assumed that no growth in electronics manufacturing employment would occur in Hawaii before 2000. The projections, therefore, ignore the needs of high technology industry for adequate industrial space.

However, in order to forcast the demand for industrially zoned land on Oahu for all other uses, employment projections from the State Input/Output Model were utilized. The number of employees required for specific employment categories, based on possible local growth rate scenarios in various industries, were projected. A land use coefficient, given in acres per employee, was calculated for each industry by taking the ratio of the current acreage in each category from the City and County of Honolulu Detailed Land Use Inventory and the corresponding number of workers employed. These land use coefficients were then used to estimate the future demand for land within each industrial category by multiplying the estimated change of employment by the appropriate land use coefficient to arrive at the estimated acreage of land necessary to fulfill the projected demand.

According to the study, the demand for additional industrially zoned land will increase from 407 acres during the period from 1970 to 1980, to 523 acres during the following decade. The report states that "in general, the demand for industrial land is expected to increase with each decade until the end of the century."

The tight demand for industrial land on Oahu is substantiated by a number of other indicators. The relatively high acquisition costs, low vacancy rates, low turnover, and rapid absorption of adequate industrial sites point to a shortage of well-located, developable industrial parcels.

In 1970 an inventory of vacant, industrially zoned land was conducted which identified 452 acres of industrial land available for development [Urban Research Study in Support of the Halawa Industrial Park General Plan Amendment, Planning Department Ref.# 41/C1/32]. The inventory was based on the State Tax Office computer inventories of all vacant industrially zoned land on Oahu effective July 1, 1970, and field inspections of key parcels. A review of the specific parcels identified in the Study was made by John Child & Co. in 1977 in support of a petition before the Land Use Commission by Oceanic Properties, Inc., requesting urban land use designation for an employment center at Waipio, Oahu [LUC Docket # A78-445].

The current status of each parcel was determined by reviewing the City and County of Honolulu General Planning Department's Detailed Land Use Inventory of

September 1977, the Real Estate Atlas Of the State of Hawaii, Tenth Edition, 1977, and the records of the City and County of Honolulu Building Department to determine how much of the original inventory was available for development.

Of the 452 acres identified in the Child & Co. study, approximately 292 acres had already been or were in the process of development; virtually all of these parcels were developed for industrial use. The remaining 160 undeveloped acres included both vacant land and parcels developed with lower-order uses and still judged available for industrial development.

The absorption of 292 acres during the intervening period gives some indication of the absorption rate for industrial land on Oahu. Calculated on a six-year time period, an absorption rate of approximately 49 acres/year is indicated. This represents the minimum rate of absorption since it discounts lower-order land uses, does not include industrial uses of non-industrially zoned land, and does not reflect the conversion of non-industrially zoned land to industrial zoning. It does, however, reinforce the estimates of demand made by the DPED as indicated above. The DPED's projection of 523 acres needed between 1980 and 1990 averages to 52 acres/year, in the same order of magnitude.

The Child & Co. study also reviewed annual turnover of properties in selected industrial areas between 1972 and 1977. During that six-year period properties in major industrial areas had been experiencing a decreasing annual turnover rate; industrial areas with a turnover rate of 4 percent to 12 percent of the lots in 1972 experienced turnover rates of from 1 percent to 2 percent in 1976 and 1977. Although the low turnover rates in 1976 and 1977 may be reflective of the sluggish economy during this period, few industrial properties were listed which tends to support the contention of a tight market for industrial sites.

The recent DPED study Expanding Hawaii's Electronics Industry established a goal of expanding the local electronics industry by 1000 new direct jobs and additional annual revenues of $50 million within five years. Using the land use coefficient for electrical equipment manufacturers given in the DPED Kakaako Study cited above (0.123 acres/employee), approximately 123 acres of industrially zoned land would be necessary to support this five-year goal.

Lest this seem like an overly ambitious employment goal, it is helpful to keep in mind the large size of typical American electronics manufacturing firms. The average firm size for selected U.S. electronics firms in 1977 [SIC Codes 3573, 3671, 3674 - 3679, 3661, and 3662] was approximately 202 employees per establishment.

The goal of Expanding Hawaii's Electronics Industry, therefore, represents the expansion or creation of about one average sized firm per year. If achieved, this would require about 25 to 30 acres of industrial land per year in addition to the 49 to 52 acres previously projected as necessary to support the normal growth of Hawaii's manufacturing economy. One electronics firm that has contacted the DPED about locating in Hawaii indicated that it would require at least 100 acres if it decided to expand in the State.

Sites for a High Technology Industrial Park on Oahu

The lack of suitable industrial space in the State of Hawaii is a major impediment to Hawaii's efforts to broaden and diversify its economy by developing

an electronics/high technology industry. Efforts to seek the relocation of Mainland and foreign high technology firms to Hawaii and to stimulate the growth of Hawaii's homegrown technology-based industry will not bear fruit until suitable locations for these types of firms can be found.

In areas that are our major competitors for the relocation or expansion of these types of firms, such as the American Southwest, land costs are significantly less than Hawaii's. Columbine Industrial Center in Colorado Springs offers developed industrial park sites for lease at $2,500 to $6,000 per acre per year; Deming Industrial Park in New Mexico offers sites for sale at $3,000 per acre; and the Port of Tillamook Bay Airport and Industrial Park in Oregon leases sites for $960 to $2,400 per acre. Oahu's largest industrial area, the Campbell Industrial Park, by comparison, offers developed sites for about $8000 per acre per year with an escalator clause that ties the annual lease to the Consumer Price Index. Only 46 acres are available in the Park at this time. Further, high technology firms are reluctant to locate in a heavy-industrial park, such as the Campbell facility. Many insist on a campus-type setting surrounded by similar firms.

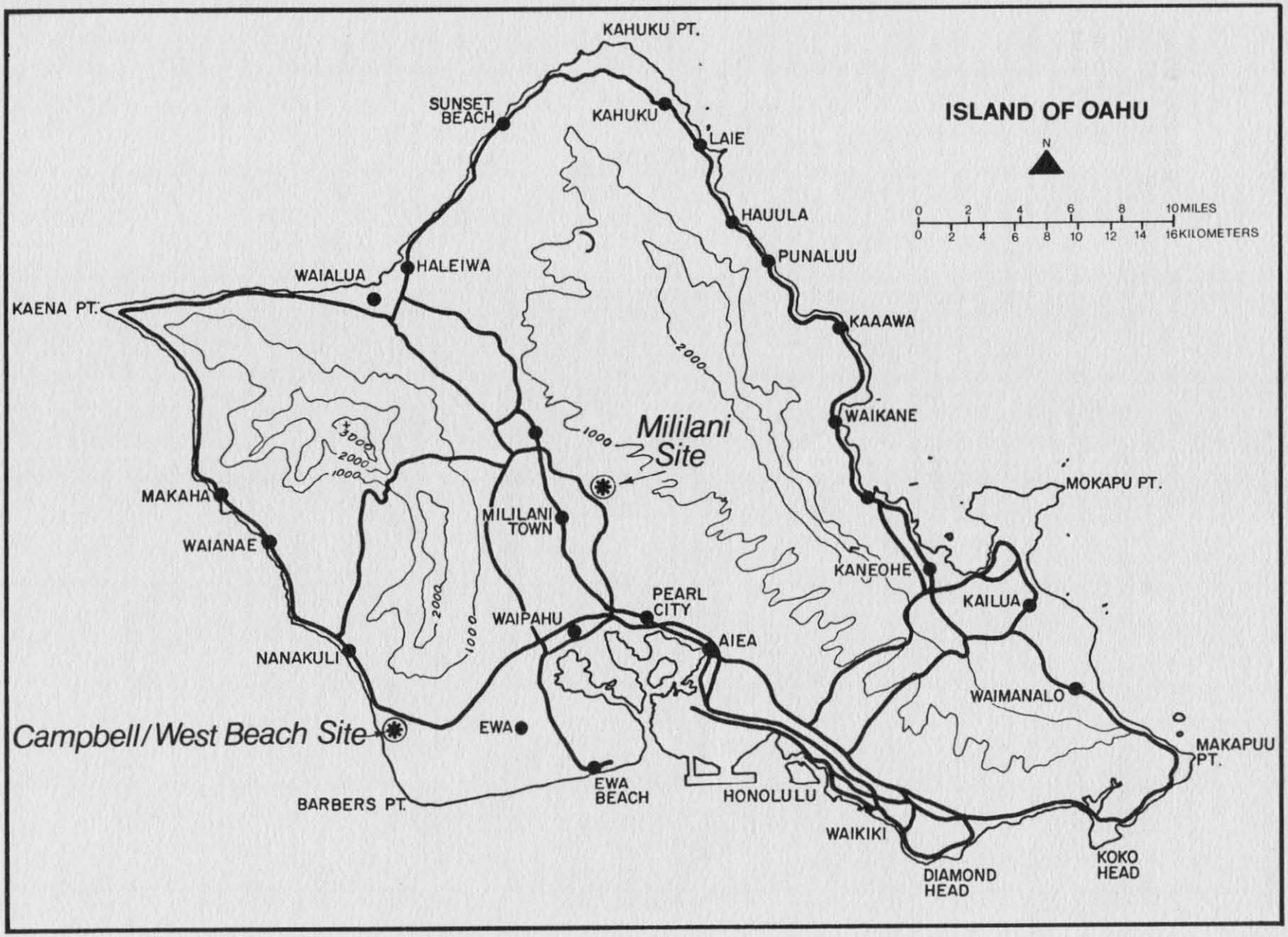
A principle advantage of an planned technology park is that it offers prepared sites which can reduce the pre-planning time required for industrial development by government permitting and other regulation.

A number of examples of parcels of land suitable for the development of an high technology industrial park are in the Central Oahu/Ewa area. One possible site is along the H-2 Freeway mauka of Mililani Town and north of Waiawa Ridge on what is now pineapple land. Another suitable tract is currently being developed as a diversifed industrial park in conjunction with the deep-draft harbor on lands adjacent to both West Beach and the existing Campbell Industrial Park (see map on following page).

Population and housing statistics indicate that there was considerable growth and development in Central Oahu/Ewa between 1960 and 1970. This growth trend continued into the 1970's at a somewhat more moderate pace. Renewed activity is likely in the near future as the State, the City and County, and planners for private landowners expect more residential and mixed-use development in this area in the 1980's.

Mililani Town, south of the H-2 Freeway site, plans to add over 10,000 additional single-family residential and townhouse units within the next decade. South of Mililani Town, Gentry-Waipio's plans will result in the development of 1,700 single-family residences, 1,500 low-density apartment units, and 500 medium-density apartments. To the southwest, Makakilo has plans to build an additional 4,500 single family residential, apartment, and townhouse units within the next 10 years. Horita's West Beach development envisions the construction of 2,000 single-family, apartment, and townhouse structures adjacent to the Campbell Industrial Park site. Amfac's plans for Waiawa Ridge, currently in sugarcane, include the development of a 1,703-acre residential/diversified agricultural subdivision.

In 1974, Campbell Estate released a plan which envisioned a new city at Honouliuli on 7,200 acres of sugarcane land adjacent to the Campbell Industrial Park and Ewa. Current plans for urbanizing the Estate's sugar lands are greatly scaled down from the 1974 proposal. Nevertheless, a considerable tract, some 2,000 acres


ISLAND OF OAHU
N
0 2 4 6 8 10 MILES
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KAHUKU PT.
SUNSET BEACH
KAHUKU
LAIE
HAUULA
PUNALUU
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WAIKANE
HALEIWA
WAIALUA
KAENA PT.
MAKAHA
WAIANAE
NANAKULI
MILILANI TOWN
Mililani Site
WAIPAHU
PEARL CITY
AIEA
KANEOHE
KAILUA
MOKAPU PT.
WAIMANALO
MAKAPUU PT.
Campbell/West Beach Site
EWA
EWA BEACH
BARBERS PT.
HONOLULU
WAIKIKI
DIAMOND HEAD
KOKO HEAD
3000
2000
1000

of Oahu Sugar Company land, is planned for urbanization before the year 2000, including parcels in Ewa, Ewa Beach, and West Beach.

Current forcasts of population densities in the area estimate that the resident population of Ewa/Central Oahu will exceed 223,000 persons by 2000, at which time the area will contain over 24 percent of Oahu's resident population. The Ewa/Central Oahu area thus offers the advantages of an expanding labor pool in close proximity, as well as numerous planned and proposed housing developments.

In the past, population growth and commercial expansion in the Leeward Oahu area, the redevelopment of tracts of industrial land in Honolulu, increasing rents and leases for centrally-located industrial land, and improvements in Oahu's transportation systems (i.e. the construction of the H-2 Freeway and the extension of H-1 Freeway to Kahe Point) have all combined to make industrial use of lands in the Leeward area relatively more economic. The development of the H-2 freeway, in particular, offers the possibility of industrial uses for lands in the Central Oahu plain that were formerly too distant from the Honolulu city core and its surrounding international transportation facilities, Honolulu Harbor and Honolulu International Airport.

The demand for new industrial lands has not been satisfied by older industrial areas such as the Mapunapuna, Kakaako, and Airport industrial tracts. As a result, the Waiau Light Industrial Park, Newtown Industrial Park, Waiawa Industrial Park, and Gentry-Waipio Industrial Park were developed and successfully marketed.

The physical and financial feasibility of developing any of the proposed high technology industrial park sites is heavily dependent on the topography and local site conditions, access, location, and ownership. Although site-specific feasibility studies are not part of this report, it is important to note that the substantial size, level topography, proximity to transportation systems and residential areas, and single ownership of each of the properties will afford an integrated approach to the development of the proposed high technology industrial park.

Water Availability and Potential Demand

Domestic water in the Leeward area is obtained from deep wells which tap the Pearl Harbor basal aquifer. The Crestview and Mililani Town deep wells draw up water from elevations of 20 to 26 feet. North of Mililani in Wahiawa, wells draw water from a high-level aquifer located from 250 to 300 feet above sea level.

The Campbell Industrial Park currently derives its water supply from three deep wells which draw water from the same body of basal water; one of the wells is located near Makakilo, one near Waipio, and the last and most recently developed, is in Kunia. Present water supply commitments by the BWS include amounts to Mililani Town from the currently approved Mililani deep wells; five deep wells are currently in service and an additional three deep wells are planned to serve the area.

The entire Central Oahu plain from Barbers Point to Wahiawa is currently under a water use moratorium imposed by the State Land Board; new developments in the area must first obtain a water use permit from the Land Board.

The Honolulu Board of Water Supply calculates that light industrial developments demand 4,000 gallons of water per acre per day applied to the total area less 15 percent for roads:

Planned Phase I Area	=	300 acres
Less Roads (15% of area)	=	45 acres
Net Area	=	255 acres
Average Daily Water Use (255 acres x 4,000 gpd/acre)	=	1.02 million gpd
Maximum Daily Water Use (1.5 x Average Daily Water Use)	=	1.53 million gpd

For comparison, irrigated sugar cultivation consumes an estimated 1.3 million gallons of water per acre annually (about 3,600 gpd/acre) after subtracting the amount of water that penetrates past the root line and percolates back into the basal lens. The proposed high technology industrial park will thus consume about the same amount of water as the equivalent acreage of irrigated cane.

In this context it must be remembered that the industrial water use proposed is a productive use, like agricultural use, rather than a consumptive use, such as water demanded by residential developments. The value of cane sugar production has been estimated at only $1.40 per 1,000 gallons of irrigation water used annually; the same amount of water (373 million gallons) proposed to be diverted to industrial use for the high technology industrial park would provide much greater income and employment than if used for agriculture, if the proposed industrial park grosses more than equivalent sugarcane acreage. Since 255 acres of sugarcane produces only $521,220 this result is almost certainly assured. For example, based upon the return per acre indicated in the $50 million/1,000 worker industry discussed previously, the proposed 255 acre phase I high technology industrial park could achieve sales of $104 million -- $407,000 per acre or $279.00 per 1,000 gallons of water used annually.

As part of the overall Hawaii High Technology Development Plan and to assure that the maximum social and economic benefits are derived from future use of Hawaii's scarce supplies of fresh water, it is thus logical that in areas of restricted water supply the highest priority for water use should be given to the high technology industry.

Electrical Power Availability and Potential Demand

Hawaiian Electric Company currently has an installed capacity of 1,209 megawatts. Peak load on the system in 1978 was 917 megawatts, leaving 292 megawatts available. Some of this amount was unavailable due to scheduled maintanence or partial system failures. During 1978, however, over 100 megawatts was available but not needed. Hawaiian Electric Company has never had any brownouts (reductions in service voltage) or rolling blackouts (sequential interruption in successive service areas). Moreover, since system peak loads on Oahu typically occur in the early evening hours due to increased residential use, ample generating capacity is available for industrial use during the day, unlike in most Mainland service areas where industrial electrical use causes system peak loads to occur in the middle of the working day.

The $50 million/1,000 employee electronics industry proposed in the DPED report Expanding Hawaii's Electronics Industry will consume approximately 15 million KWH of electricity annually based on U.S. electronics industry average power consumption. This represents only 0.5 percent of current local demand for electrical power.

Hawaii has also undertaken an aggressive program to develop alternate energy resources; including wind energy with a major development slated for the Kahuku area on Oahu; ocean thermal energy conversion with a major development project off Kona on the Big Island; and geothermal energy in the Puna area of Hawaii. Geothermal energy will be the quickest producer of energy for the State. A project already underway is a joint venture between Barnwell Geothermal Corp. and GEDCO of Hawaii. Another joint venture, between Dillingham Corp. and the Thermal Power Company of California, plans to drill two 8,000 foot wells in Puna at a cost of $2 to $3 million each. Drilling began in 1981.

Capital Availability in Support of High Technology Industry

Venture capital is being used more and more throughout the Mainland United States to fund new and growing enterprises which have great potential and which cannot meet their capital needs through existing financial institutions. Venture or equity capital is capital provided for a share of the expected profits of the firm as opposed to debt capital which is the provision of financial assistance at a previously agreed upon rate of return. It usually takes the form of purchase of a set amount of the common stock of the privately held company which the venture capital firm invests in.

The venture capitalist will often take a role in the management of the firm usually by sitting on the Board of Directors. In other words, for venture capital offered to the firm, the firm gives up a part of its ownership.

Many successful electronics companies in the United States have been assisted by venture capital firms. The venture capitalist usually specializes in a particular industry, such as electronics. He analyzes the potentials of various companies that have a need for venture capital and decides which company has the best prospects. If the company is successful, the venture capitalist profits through the appreciation of his investment in the capital stock of the company.

In the electronics venture capital field, a minimum return on an investment is three to five times the invested capital within a seven-year period. Venture capital is known to have returned as much as 40 times its investment and many venture capitalists have become wealthy by investing in the right firms. An R & D venture capital partnership has considerable tax write-off advantages as well. When the investment is made, the entire amount can be written off. The returns to the investor are royalties from the development of products, and partial ownership of the firm.

In addition to electronics industry firms, the venture capital financing approach has been very successful in the development of gene-splicing technologies; many venture capitalists have invested in these firms which may have tremendous potential for the future if the gene-splicing techniques developed can be patented and marketed as a final product or an improvement of an existing product. A

number of the largest companies in the nation are establishing venture capital subsidiaries which take these kinds of risks which the parent company is not normally willing or able to take.

One approach to success in developing the electronics industry in Hawaii is to establish a venture capital fund of between $5 and $20 million. With a $5 million fund in a period of five to seven years, some eight to ten companies could be assisted. Hawaii lacks venture capital and investors in Hawaii are not familiar with the high technology industry. Most entrepreneurial activity in Hawaii to date has gone into the development and improvement of real estate.

Mainland venture capitalists, on the other hand, are not familiar with Hawaii, and are reluctant to invest in Hawaii companies because of the problems of dealing with a company that is at least 2,500 miles away across the Pacific Ocean. Time is an essential ingredient for a venture capitalist and to attend a board meeting in Hawaii would require several days including travel time.

It is therefore logical that Hawaii consider establishment of a State-supported venture capital fund totalling $5 million. Since it would be difficult to attract Mainland venture capitalists to establish such a fund in Hawaii, and since local investors are unfamiliar with the high technology industry and the potential returns to be made from their investments in this industry, it is recommended that the State of Hawaii take the lead in stimulating venture capital activity in Hawaii to assist in the growth of high technology industry.

The State of Hawaii has often taken the lead in assisting new industrial developments. It is a centralized government with strong leadership, and many of the activities normally attributable to private industry in other areas are undertaken because of Hawaii's unique situation. It would thus be prudent for the State to initiate a venture capital fund in Hawaii.

The State considered this approach last year in conjunction with a potential grant from the Federal government to establish a Corporation for Innovation Development. The Department of Commerce had indicated the opportunity for the State to receive up to $2 million in grant funds to establish such a corporation providing that the State made a similar contribution of $2 million. Unfortunately, after the proposal was submitted to Washington, D.C., the Department of Commerce ruled that the State was ineligible. Since then the State has become eligible, but the available funds have been promised to others.

Legislation was prepared which would allow for the establishment of a State-sponsored but independent venture capital firm. Although the Federal grant is not now available, the concept is still a good one and the State could initiate such a venture capital fund and make every effort to attract private capital to match the State's contribution.

A venture capital fund with $2 million available can probably assist some three to four new electronics companies to get started; with this base, private capital of at least $3 million should be able to be attracted providing a $5 million pool of capital - enough to assist eight to ten firms. Further, the investment in those firms will pay off in the future when such profits will be available for reinvestment.

This concept is not unknown in other States. Massachusetts established the Massachusetts Technology Development Corporation in 1978 to provide venture capital to high technology firms, and Connecticut has established the Connecticut Product Development Corporation for the same purpose.

Tax Incentives for High Technology Industry

Taxes are a broad responsibility of the State of Hawaii, as they are for any political jurisdiction. They must necessarily be looked at in their totality in terms of their revenue-producing propensity as well as their effect on specific interests and jurisdictions. The approach taken in this report has been to look at taxes as they pertain to the high technology industry in terms of Hawaii's objective of developing this industry in competition with other areas. Hawaii does not offer tax incentives for high technology industry. In fact, it has some taxes which act as disincentives to the establishment of this industry in Hawaii.

For example, Hawaii imposes a 4 percent use tax made on purchases outside of the State. Forty-five of the States offer use tax exemptions on materials used in manufacturing, and 36 States offer sales tax exemptions for the purchase of new equipment. Hawaii's apparent motivation for imposing the 4 percent use tax on products purchased elsewhere was to protect local industries from Mainland competition. This rational does not apply to the high technology industry because there is currently no industry in Hawaii to protect.

The use tax acts as a considerable disincentive to the establishment of a high technology firm which would purchase very expensive equipment for its operations in Hawaii. Although there is a deduction for any tax that may be paid on the equipment in another State, it is not very likely that a company would be willing to pay the initial use tax to establish in Hawaii when it can establish elsewhere without paying such tax. The State should therefore consider elimination of the use tax for the high technology industry.

Tax Exemptions

Tax exemptions in the State of Hawaii are debatable. There is a considerable feeling against them. The basic argument is that if Hawaii is suitable economically for the establishment of a particular activity, it would come here in any case, and there is no need to establish artificial incentives to attract industry.

It has been argued further that tax incentives are a minor factor in the total operational costs of a company. The National Governors' Conference has argued against tax incentives by States and municipalities. The argument is that if all 50 States eliminated tax incentives, then no one area would have an advantage over the other and revenues would not be lost providing them. But as long as there are independent governments in the United States with taxing power, tax incentives will be made available to attract industry in competition with other areas. Further, the competition is not only between the States, but between the States and foreign areas.

High technology firms are not restricted to analyzing domestic locations, but carefully scrutinize foreign potentials as well before making a decision on where to

locate. Many foreign areas have low-cost labor and professional engineers available, and offer tax incentives.

Tax incentives serve a dual purpose. They not only provide a financial advantage, but psychological incentives as well. Businessmen are always concerned with the climate in which they operate. One of the negative images that Hawaii has to overcome is that it appears to be anti-growth. Tax incentives are a strong indicator of the government's favorable attitude toward business.

One of the recommendations made in the Arthur D. Little report, Hawaii's General Excise Tax: Prospects, Problems and Prescriptions is: "Hawaii should move toward creating a favorable tax climate by continuing to selectively provide incentives for activities that show promise of making contributions to the economy."

In considering the possibility of enacting tax incentives for high technology industry, it should be pointed out that Hawaii has had a considerable history of providing preferential tax incentives for particular industries. The following are examples to show that Hawaii has not been averse to providing incentives for particular industries.

-- For the manufacturing and processing of glassine prints, grocery and ration bags, there was a real property and general excise tax exemption for five years.

-- For the manufacturing and processing of mayonnaise, there was a real property as well as general excise tax incentive for five years.

-- Similarly, for the manufacture of pulp and paper for bagasse, there is a real property and general excise tax exemption for five years from the date of commencement of construction of plant.

-- For the growing and processing of acerola, there was an excise tax exemption for five years.

-- For ti root okolehau, distilled in the State, there has been a 10-year tax exemption from the liquor excise tax.

-- For the production of fruit wine manufactured from products grown in the State, there is an exemption of some five years.

-- There is also tax exemption for motion picture or television films for more than 12 years for the general excise tax.

-- For scientific contracts with the United States, there is an indefinite tax exemption on excise taxes and the use tax for an indefinite period. A similar exemption applies to products produced as by-products from oil refinery activities.

-- During its 1981 Session, the Legislature provided exemption from excise taxes for distilled rum manufactured in the State for a period of 5 years.

Thus, it is clear that Hawaii has granted tax incentives for those activities that it wishes to encourage.

An analysis has been made of a hypothetical electronics firm locating in Hawaii with sales of $52.8 million. The results indicate that with a tax exemption on excise tax, corporate income tax and real property tax, the net profit of such a company would increase from $1.6 million to almost $1.9 million and the net profit as a percent of sales would increase from 3.1 percent to 3.6 percent.

The tax revenues that would be lost in such an incentive program for the hypothetical firm would be: real property tax, $32,000; excise tax, $261,000; and corporate income tax, $214,000. But there is no actual loss in tax revenues since the State would not have had such a firm in operation in any case; and after the moratorium period, say five years, the State would begin to enjoy tax revenues from such an operation. The multiplier effect from such activity would create other economic activity and employment which would be tax revenue producing even during the moratorium period.

Tax incentives would provide not only a psychological advantage to Hawaii, but also a real advantage in terms of increased net profits for the firm.

In addition to taxes, many States provide industrial revenue bonds as an attractive incentive for the development of high technology industries. Industrial revenue bonds are based on the financed company's earnings and do not affect the State's constitutional debt limitation, nor is there any obligation on the part of the State should there be a default. These programs are limited to a total of $10 million by the Internal Revenue Service. The industrial revenue bond issue is based on the firm's financial stability and potential, since the revenue issue has to be sold in the money markets. Such an approach would not be suitable for a new and unknown company, but can be used by companies which have an established financial reputation.

An example of the use of industrial revenue bonds and their effect on attracting industry is seen in the following quote from the Texas Industrial Update, January 1981, the official publication of the Texas Industrial Commission:

> Anyone with doubts about what revenue bonds can do for Texas can once again sleep at night. The IRB Program has been operational for about 14 months and TIC (Texas Industrial Commission) has already approved more than $412 million in projects, creating an estimated 8,897 new direct jobs.

The Hawaii State Constitution was recently amended to allow for such special purpose bonds. The procedure, however, is cumbersome. The Legislature by a two-thirds vote of the members of each House may enact enabling legislation for the issuance of bonds separately for each special purpose and entity. In other words, the Legislature by two-thirds vote of both the House and Senate can enact enabling legislation authorizing the issue of industrial revenue bonds for high technology industry.

In addition, the Legislature by a two-thirds vote of the members of each House, may authorize the State to issue bonds for each single project or multi-project program of each special purpose entity. In other words, the Legislature must first vote by two-thirds to allow special purpose bonds for high technology industry and then must consider each single project or multi-project program, also by a two-thirds majority. The question of what constitutes a multi-project program may be the key to making the industrial revenue bond program workable.

Further, a political subdivision may be authorized by a two-thirds vote of the Legislature to issue special purpose revenue bonds for each single project or multi-project program for each special entity. It is clear that the industrial revenue bond approach by Hawaii for a high technology industry would be a cumbersome effort on the part of a high technology firm seeking to obtain such assistance in comparison with other states.

The importance of incentives to various companies in locating in a particular place varies. It is clear that other factors are more important than tax incentives including such things as the availability of engineers, the availability of productive, stable, reasonably priced labor, the proximity to markets, and the general environment of the community. However, after these factors are considered, tax incentives and industrial revenue bond issues become very important to many companies in comparing one area with another.

For example, the vice president of manufacturing and operations for Atari, Inc., stated to Hawaii representatives that "tax incentives are a must" and that "following a review of engineering availability, technical workers, productivity, labor turnover and cost of living, we look at what the community has to offer in the way of tax and other incentives."

A vice president of Fairchild Camera and Instrument Corporation stated that, "Hawaii needs to offer incentives to get the industry started. Fairchild is now considering Ireland because of the incentives offered."

The vice president of manufacturing for Memorex Corporation stated that "Incentives are important; following the availability of people, incentives are the most critical factor in location decisions. Memorex is moving into Ireland because of the incentives offered. Texas gave us a moratorium when Memorex purchased 42 acres for plant location. Also, the availability of industrial revenue bonds are important in our location analysis."

The director of facilities for Varian Associates stated "Varian is moving into Ireland because of the incentives." The Irish will build their plant and pay for half of the cost as well as train workers for their employment. "Because Varian will make a $30-40 million investment in the community initially, it looks for community support in the form of incentives."

Because tax incentives can become a controversial matter and inhibit the initiation and implementation of the programs necessary for the growth of high technology industry, Hawaii should concentrate its initial energy on the getting the industry development program started in the State. Meanwhile, Hawaii should closely monitor the competitive situation. If it is found necessary to include tax and other incentives in order to secure the development of this highly sought after industry, Hawaii should proceed to do so.

Elimination of taxes which act as a particular locational disincentive, such as the 4 percent use tax and the excise tax on intermediary manufacturing should also be considered seriously.

Lack of Infrastructure to Support High Technology Industry

Hawaii lacks an integrated electronics industry infrastructure capable of supporting dramatic industry growth. This is somewhat of a "Catch-22" situation

since the infrastructure is difficult to develop without a viable operating industry. On the other hand, the industry often cannot develop without a proper infrastructure.

Hawaii's tradition has been to have limited manufacturing activity serving Island needs. Traditional manufacturing has been centered in sugar processing and pineapple canning operations as well as in the large industrial complex at the Pearl Harbor Naval Shipyard. The latter has provided the community with an industrial base and expertise which is often not recognized because Pearl Harbor is a defense establishment. However, the 5,000 civilian workers employed there represent a pool of experience in various manufacturing and engineering techniques needed by high technology industry.

Hawaii, however, has not had the tradition of establishing small manufacturing activities that is common in similar-sized isolated communities elsewhere. These types of activities will have to be developed by encouraging individuals to provide the fabrication, support facilities, and the product supply activities necessary for supporting the high technology industry. It would not, of course, be prudent to establish such activities before the high technology industry develops; they should be developed in tandem with such growth. It is vitally important, therefore, that the promotional activity for high technology industry include with it the development of the support facilities necessary for industry growth.

It should not be difficult to develop such activities because the growth of the industry offers opportunities to small businesses in Hawaii and elsewhere. It is believed that this basic fabrication and supply activity will be essentially provided by local residents who see the opportunity for this activity after an initial effort to attract some of the basic supporting activities from overseas. As indicated, there are many basic skills available in Hawaii in industrial fields. There are those who have worked in industry on the Mainland who are working in other activities here, and there are some basic fabricating facilities in Hawaii which can expand to provide the additional services and the tolerances needed in producing the supporting, fabricated products.

The State should give the infrastructure potential operations the highest priority in its Capital Loan Program and consider providing venture capital for these activities along with that of growing high technology firms.

THE DEVELOPMENT EFFORT

Based upon this evaluation of the conditions in the high technology industry -- both worldwide and in the United States -- and Hawaii's ability to develop that industry, certain recommendations are proposed.

Organization

As indicated, there are two major impediments to high technology industry development in Hawaii which deserve immediate action by the State. The actions proposed are (1) make land available for a high technology industry and (2) reform Hawaii's tax structure to support the industry's development.

The question of making land available is one that will have to go through the existing process of rezoning land from its existing use to high technology industrial use and will involve the Land Use Commission as well as the City and County of Honolulu's zoning powers. Normally this effort takes a long time but it is strongly recommended that expedited action be taken to set aside land for high technology use. This is discussed in more detail in other sections of this report.

While action is being taken to make land available, the State should concentrate its initial efforts on the attraction of research and development activity and homegrown industry development . These activities do not need large amounts of land and could feasibly be located in suitable light industrial or commercial space in Honolulu.

In order to overcome the negative image of the State as anti-growth and as a resort center and also to insure that the potential targeted companies realize that Hawaii is serious in its efforts to develop high technology, it is recommended that the Office of the Govenor of Hawaii be involved in Hawaii's efforts to attract high technology activity.

It is recommended that a State/industry cooperative effort be established. Initially, funding should come from both industry and government, but as the high technology industry develops in Hawaii private industry should become the dominant element in the attraction of high technology companies.

A High Technology Advisory Group (HTAG) should be organized to advise the Governor and the DPED. The Governor should be closely identified with Hawaii's efforts to develop and expand its high technology industry.

The Department of Planning and Economic Development should be directly responsible for high technology industry development. The State Department concerned with a specific problem such as the Department of Taxation on tax problems, the Board of Land and Natural Resources should fully participate when questions pertaining to its respective responsibilities are discussed.

The basic responsibilities of the HTAG would be advisory in nature. The Economic Development Division of the DPED, which has spearheaded the organizational and promotional effort for the Department in attracting high technology industry, could act as staff for the HTAG.

Private industry members should include Hawaii landowners interested in providing land for high technology development and State and County officials closely connected with the high technology industry who have participated in the formative effort to expand high technology activity to Hawaii.

Supporting Promotional Advertising Effort

A supporting promotional advertising effort should be undertaken which would include advertising in trade journals, business periodicals, a direct mail effort and a publicity effort. It is estimated that this program can be undertaken during the first two years at a cost of some $128,900 for the first year and, with an 8 percent inflationary factor, $139,000 in the second year. The advertising effort should be divided into three sub-activities: (1) a media advertising program; (2) a direct mail program; and (3) a publicity program.

Concentration of the promotional effort would be in the Silicon Valley in California and on Fortune 500 companies which may be interested in expanding into electronics and other high technology activity. No major company will relocate its entire activity to Hawaii. Hawaii's strategy should be to seek the expansions of growing companies. Many companies in the electronics field prefer to have no more than 500 or so individuals in any expanded activity because larger operations often become bureaucratic and stifle creative effort. Other companies make major expansions in fully integrated units which can run as high as 1,500 to 2,000 people.

Although the industry has grown very fast and is expected to continue to grow, with the exceptions of lulls during recessionary periods, each company typically would take 18 months to three years to establish in a new location. It is important to establish a relationship with these companies to be aware of their plans and to assist in providing information and other help so that when the expansion takes place, Hawaii has the best possible chance of attracting such an activity. It is necessary to establish a long-term, sustained personal contact effort.

This effort should be targeted for the first and second years at the Silicon Valley with some of the effort in direct mail and publicity going Nationwide and to Japan. The program should emphasize the positives about Hawaii in order to overcome the negative image mentioned above. The State's positive attitudes toward growth, citing the actions and statements of the Governor, the State Legislature, County officials and private industry leaders, should be emphasized. The availability of electronics engineers graduating from the University of Hawaii and the many residents who are experienced electronics engineers, technicians, chemists and physicists working in the high technology industry on the Mainland -- and who would like to return -- would also be a positive emphasis in the advertising promotion effort. The desire of Hawaii to develop in a highly scientific and technological way while maintaining the attractiveness and environmental quality of this uniquely beautiful State should be the thread that runs through the entire campaign. The available and stable hardworking labor force is a major advantage for Hawaii over many other areas. The availability of frequent and modern communication and transportation services should also be emphasized. The support of a excellent university and the scientific and technical activities either underway or planned in Hawaii would also serve to overcome negative images of the State being strictly resort-oriented. Hawaii's unique location as a crossroad between

Asia and North America, and its suitability as a base for expanding operations in the Pacific by technology companies in North America, should also be emphasized.

As indicated, the advertising program should be targeted at the California Silicon Valley area with additional coverage to a broader market. Publications ideal for the advertising program include: The Wall Street Journal, Western Edition; California Business; Northern California Electronic News; Peninsula Times; Electronics Magazine; and the San Francisco Business Journal. The direct mail effort should be directed at decision-making executives in high technology firms and to Fortune 500 company executives. The publicity effort should include timely releases on Hawaii's economic diversity to overcome the image of a strictly resort area, Government statements and news announcements which also would contribute to overcoming the image of being anti-growth; and other specific stories on developments such as technology company startups, new scientific developments in Hawaii, and University of Hawaii research activities.

Promotional and Advertising Budgets

The following is the summary budget for the advertising and personal contact segments of the development effort:

Advertising	$ 60,000
Production	6,000
Direct mail	20,000
Publicity	18,000
Personal Contact	20,000
	$124,000
State of Hawaii 4% Tax	4,960
Total	$128,900

The second year's budget with an 8 percent inflationary increase would total some $139,000.

An assessment of the program's effectiveness should be made during the second year to determine whether funding support for the program should be increased.

After the advertising program is started, groups of businessmen and government officials should address key industry executives at well planned luncheons and call on executives in targeted firms on a one-to-one basis. This type of mission should be undertaken at least once a year. Members of the High Technology Advisory Group should also visit successful Mainland high technology industrial parks, such as the Research Triangle Park in North Carolina.

Hawaii must be prepared to make this minimal investment in its effort to develop high technology industry. The benefits that Hawaii will reap from such an effort promise to be extraordinarily high compared to the costs incurred.

After the High Technology Advisory Group (HTAG) is established, certain tactical marketing steps can be taken. These are discussed below.

Hawaii's Psychological Set

Hawaii must realize that the development of a high technology industry is not an overnight affair, but requires a long-term aggressive, tenacious effort in strong competition with many other areas. It has to be willing to provide the resources and effort over a long period, the initial goals taking at least five years to achieve.

Goal

Hawaii's goal of developing a high technology industry which will provide 1,000 jobs and $50 million in sales in five years is clearly attainable. This is a modest goal and with the proper positioning and effort, Hawaii should be able to easily surpass it.

Approach Strategy

As mentioned above, the primary overseas effort by Hawaii should be with Silicon Valley firms in California and with Fortune 500-type firms expanding into the high technology area. A secondary effort should be made in the initial phase with Japanese firms who will be major factors in the high technology industry.

The effort should emphasize the high quality of life in Hawaii. Hawaii is a high-value place -- a first-rate environment conducive to R & D and high technology manufacturing activity and growth, attractive to engineers and technicians. The programs to support this effort are described in this report. Hawaii must be willing to commit the funds and the people to make this effort a success. The potential positive results for Hawaii are immense.

Hawaii must be willing to overcome the impediments to the development of high technology industry in the State in order to make this effort a success. It must be willing to make an objective appraisal of itself on a continuous basis as it compares itself with its competition. It must, for example, be willing to consider taking some limited amount of land out of agriculture for high technology use.

It must be willing to eliminate those taxes which will be an obvious hindrance to the location of this industry in competition with other areas.

As it assesses its efforts, it must be willing to provide tax and other incentives needed to provide the right psychological atmosphere and to make up for high startup costs in Hawaii. There is plenty of precedent in Hawaii for tax incentives for particular industries and Hawaii should be willing to provide them in the future, if necessary.

High technology is the fastest growing industry in the world. Hawaii's location does not put it at a competitive disadvantage as is the case with so many other industries. This industry offers Hawaii the opportunity to attract a "campus-type" industry which fits well within the concept of the Hawaii State Plan and the desire of its people to keep Hawaii environmentally pure and beautiful. The basic question facing Hawaii is its "will" to attract this industry. The industry will not come to Hawaii if Hawaii is complacent in its efforts or if its efforts are mediocre or

limited. If Hawaii, however, can organize itself and undertake the necessary aggressive and sustained effort needed, it stands to reap benefits for its people for generations to come.

Japan Campaign

The same kind of sales and marketing effort to attract U.S. companies needs to be done in Japan. However, the limitation of resources, and the expectation that a two-pronged effort at this time and at similar levels is not feasible leads to a conclusion that the strategy should be an emphasis on the U.S. market for the moment, particularly the Silicon Valley. After three years of this program, a stronger effort should be generated in Japan.

In the meantime some efforts can be undertaken with Japanese companies. A direct mail campaign with letters coming from the Governor of Hawaii and the Director of the Department of Planning and Economic Development could be sent to major executives of companies in Japan which are leading in high technology development. The letter could invite them to discuss the possibility of establishing manufacturing operations in Hawaii as a springboard market for the U.S. Mainland. The emphasis here should be on the availability of productive, stable labor and electronics engineers. One Japanese company, for example, which manufactures an expensive golf club in Hawaii (Honma Golf Company of Yokohama) has indicated that labor productivity in its plant in Hawaii is equal to that in Yokohama.

In addition to the letter-writing effort by the Governor and the Director of the Department of Planning and Economic Development, it is suggested that the Hawaii International Services Agency organize businessmen in Hawaii who travel regularly to Japan so that these businessmen might call on the appropriate government and private industry executives in Japan to explain Hawaii's interest in having Japanese companies invest in the State.

It is important, however, to emphasize that in these efforts concerning Japan, Hawaii should expect only first-class industrial operations such as are found in the Silicon Valley in newer electronics company plants. The Japanese, because of a shortage of space, have not had the same environmental emphasis as have American high technology firms. Therefore it is important to emphasize both to Japanese and U.S. firms that Hawaii expects only the most environmentally suitable type of high technology operations.

Hawaii's assets can be exploited among Japanese high technology companies which are being forced by economics to expand their facilities in other countries. Nippon Electric is in Ireland and California, while Hitachi has moved into West Germany and Texas. The lure here is the potential to reduce some transport costs, but most important, tariffs.

In addition to Hawaii's other basic attributes which should always be noted -- physical beauty, a stable labor force with available engineers, an existing scientific community, a history of government and community support for business and industry -- the campaign for Japanese business could place special emphasis on the following facts:

Japan is already the largest single overseas investor in Hawaii with 234 companies (1976) worth more than $1 billion. Japan has been investing in Hawaii since 1892.

Hawaii is relatively close to Japan, and is part of its largest market for microelectronics -- the United States Mainland.

Hawaii has Foreign-Trade Zone Number 9.

Local Education Program

One of the most important activities in establishing a high technology industry in Hawaii is to adequately educate Islanders on what the high technology industry can mean in terms of jobs, enhancement of the environment, and stimulus to the State's economy. Without proper education, this very important potential for Hawaii can be misunderstood. With adequate educational effort, the vital support of the public can be obtained.

SUMMARY OF RECOMMENDATIONS

Organization

The Department of Planning and Economic Development should be the agency directly responsible for the high technology development effort.

A High Technology Advisory Group (HTAG) should be organized to advise in the development of the industry in Hawaii. Members of the Advisory Group should include Hawaii landowners interested in providing land for high technology development; individuals closely connected with the high technology industry in Hawaii; and those who have participated in the effort to attract high technology activity to Hawaii.

During the initial period of establishment, the State of Hawaii should fund a promotional program.

Land, Water, and Tax Structure

Hawaii should provide for the rezoning of land in at least two areas on Oahu, from agricultural use to high technology use in a minimum increment of 300 acres per area, with surrounding land available for expansion.

As part of the overall Hawaii High Technology Development Plan and to insure that the maximum social and economic benefits are derived from future use of Hawaii's scarce supplies of fresh water, in areas of restricted water supply the highest priority should be given to the high technology industry.

Hawaii should consider eliminating the use tax for high technology equipment purchased on the Mainland or elsewhere for use in Hawaii high technology manufacturing. The State should also consider the elimination of the excise tax for the entire high technology industry.

The State should monitor incentives offered by other areas to attract high technology industry to determine whether it is losing targeted high technology companies because the State does not offer similar incentives. If it is determined that such incentives would have made the difference in overcoming negative factors in locating targeted companies here, Hawaii should consider establishing an incentives program directed specifically at high technology operations.

Capital Availibility

Hawaii should consider establishment of a venture capital fund totaling $5 million. Since it would be difficult to attract Mainland venture capitalists who would establish such a fund in Hawaii, and since local investors are not familiar with the high technology industry and the potential returns to be made from investments in this industry, it is recommended that the State of Hawaii take the lead in stimulating venture capital activity in Hawaii to assist in the growth of high technology industry.

The State should give the infrastructure needed for potential operations the highest priority in its Capital Loan Program, and consider providing venture capital for these activities along with that of the smaller growing high technology firms.

Promotional Campaign

Since Hawaii will embark upon a public campaign to develop high technology industry -- through direct contacts, public relations, advertising, and direct mail -- it is recommended that the following be emphasized:

Hawaii has an established scientific community with leadership in agri/aquaculture, energy, and astronomy. The intellectual community is supported by the University of Hawaii, the Hawaii Institute of Electronics Research, and the East-West Center.

Hawaii has an available technical labor force which can be swelled by Hawaii scientists and engineers forced to work on the Mainland due to lack of work in Hawaii, but who want to return. Hawaii has available electronics engineers and other professional people of scientific background. It has a labor force which is available, productive and stable. It has an excellent University, reputed to be fifth in the nation in electrical engineering. It also has had the foresight to establish the Hawaii Institute of Electronics Research to assist this industry in its development and in its research needs.

Hawaii is strategically located with a highly sophisticated transportation and communications network. It has high mountains with the clearest air available allowing for astronomical research. It also has deep ocean waters nearby which allow for underwater research including defense establishment research. Its geographical location is suitable as a springboard into the Pacific and Asian markets by American firms yet it is still American soil. It can also be a springboard into the American market by Japanese firms.

Hawaii is a special place in terms of its environment, its beauty, the fact that it has the cleanest air and cleanest water of any community in the United States. Hawaii should indicate that any new plant must keep the highest standards in structural design, landscaping, recreational facilities for employees, etc.

Hawaii, therefore, is indeed something special. And just as a product must be positioned in the marketplace, so Hawaii must position itself in the marketplace as a high-valued location for high technology industry activity. These points made before appropriate high technology industry people would be stressed in conjunction with specific information about land sites available.

The Targets

For Hawaii's efforts to be optimally effective and efficient, Hawaii's efforts should be targeted toward the following:

Business

The immediate target industry should be microelectronics with emphasis on the research facilities this requires and the semi-finished or finished products that utilize that technology. It is recognized that this non-polluting light industry is growing rapidly (from $800 million today to $6.0 billion by 1990). Concentration of the promotional effort should be in the Silicon Valley in California. The secondary target industries should be Japanese firms expanding into the high technology microelectronics field. These firms would be most vunerable to what Hawaii has to offer.

People

The people to be targeted are corporate decision-makers -- those in faster growing companies which will have to move in the near future. Also, of critical importance are the scientists and engineers who are in increasingly short supply. More and more often, when companies consider expansion, they must consider where their scientists and engineers want to live.

Targeted Corporations

It is recommended that companies with high growth rates be singled out as the most promising candidates for relocating in Hawaii, and that a direct advertising, promotion, and personal contact campaign be directed toward their decision-makers. High-growth-rate corporations are the most likely to be forced to relocate expansion facilities away from mother areas because of labor shortages.

High Technology Fairs and Conferences

It is recommended that Hawaii be represented at high technology fairs and conferences in Europe to bring to the attention of European companies the benefits of establishing operations in Hawaii. Also, as part of the U.S. campaigns, Hawaii should attend U.S.-sponsored high technology conferences.

Labor Force Campaign

Since labor shortages --both scientific/technical and production line -- are the most pressing problems facing the high technology industry, it is recommended that a specific campaign be developed from the Hawaii story, stressing the State's educated, stable, and productive labor force. This information would be developed for personal contacts, brochures, and direct mailing.

Hawaii Technical Labor Pool

We recommend that a Hawaii Technical Labor Pool report be established and updated on a regular basis to aid in the recruitment of ex-Island scientists, engineers, and technicians, and to act as an inducement for companies with labor problems.

Appendices

STATUS OF THE DEVELOPMENT EFFORT

Recognizing the opportunity for the development of an electronics industry, the Economic Development Division, of the State Department of Planning and Economic Development held two seminars in July and August of 1978 at Kahi O Mohala in order to explore the feasibility of developing an electronics industry in Hawaii.

As a direct result of these seminars, the Hawaii Institute of Electronics Research was established as a research support arm for the electronics industry. A contract was made with the State of Hawaii (DPED) to provide $125,000 for the operational support of this organization during the first year of its operations. Other funds are to be raised by private industry. The State has also budgeted $100,000 for HIER's second year of operation.

In January, 1979, the report Expanding Hawaii's Electronics Industry was prepared by the Economic Development Division, DPED. It analyzed the industry and its benefits, Hawaii's suitability for this industry, and established development goals, strategy and programs.

A promotional brochure and a slide show were also prepared for promotion of the industry. Hill and Knowlton's San Francisco office assisted in the arrangement of group meetings and contacts.

In June 1979, two well-attended luncheons were held in Palo Alto and San Francisco with a delegation of speakers from Hawaii headed by Governor George R. Ariyoshi. In September 1979 and June 1980, person-to-person contact trips were made by Messrs. Bernard Hill, Hawaiian Telephone Co. and Andrew Gerakas, DPED. In addition, there is a continuing direct-mail effort to electronics industry executives and direct phone contact through a toll-free line at DPED.

There are currently three electronics manufacturing companies in Hawaii:

1. Intellect, Inc. -- Design, manufacture and sales of air traffic control equipment throughout the world. It employs 50 people and is currently seeking venture capital for its expanding operations.

2. Adtech, Inc. -- Custom design, development and fabrication of electronic instruments and computer systems. It employs 20 people.

3. U.S. Assembly -- Manufacture and testing of circuit boards on contract. It started operations in July, 1980, currently employs 15 people, and planned to expand employment to 60 by the end of 1980.

CALIFORNIA ELECTRONICS COMPANIES

Primary Prospects for Expansion in Hawaii

ROLM CORPORATION, 4900 Old Ironsides, Santa Clara, CA 95050 — (408)988-2900

Employs 2,700. Among the most rapidly expanding companies in "Silicon Valley." Products include general purpose digital computers for severe environment applications; computer- controlled private automatic branch telephone exchange systems; etc. New site selection procedure -- Klaus Kramer, Director of Corporate Construction, collects information and makes recommendations for new sites. He reports to Bob Dahl, Vice President, who is in charge of final selection, along with Kenneth Oshman, President, who gives final approval.

AMPEX CORPORATION, 401 Broadway, Redwood City, CA 94063 -- (415)367-2011

Employs 12,200. Adds or subtracts a facility nearly every month. Products include video recording equipmment; audio-video systems; computer data storage equipment; instrumentation recording devices; blank recording tape and custom duplicated tape; audio and video recorders; systems and related equipment; computer data storage equipment and instrumentation recording devices. New site selection procedure -- Neal Wineman, Corporate Facilities Manager, collects information and selects new site locations, with final approval by Arthur Hausman, President and Chief Executive Officer.

MEMOREX CORPORATION, San Tomas at Central Expressway, Mail Stop 1239, Santa Clara, CA 95052 -- (408)987-1000

Employs over 8,000. Always looking at new site possibilities. Products include data processing equipment, disc storage products, tape drives and controllers, semiconductor memories, line printers, disc packs, computer tape, recording tape, etc. New site selection procedure -- Walter Kurgas, Vice President of Manufacturing, collects information and makes recommendations for final approval by Clarence Spangle, the new President and Chairman of the Board.

TRW, Project Telecom, 1475 South Bascom Avenue, Campbell, CA 95008 -- (408)425-1220

Project Telecom is a new development within TRW. The parent company employs 82,757, producing a wide range of electronics equipment.

FORD AEROSPACE & COMMUNICATIONS CORPORATION, Western Development Laboratories Division, 3939 Fabian Way, Palo Alto, CA 94303 -- (415)494-7400

Employs 3,739. Interested in keeping current on new site possibilities. Products include communications and meteorological satellites; spacecraft antennas, transponders and other subsystems; ground terminals/antennas for satellite communications, telemetry, tracking and control; display systems; scanning systems; etc. New site selection procedure: R.A. Ezekiel, Director of Operations Support, collects information and makes site choice, with close reporting to Dr. K.L. Rose, President.

BOURNS, 1200 Columbia Avenue, Riverside, CA 92507 -- (714)781-5690

Employs 4,595. Always considering new locations. Products include adjustment potentiometers, precision potentiometers, rotary controls, transformers, inductors, networks, transducers, sensors, controllers, medical equipment, data entry equipment. New site selection procedure -- Ed Bowman, Director of Corporate Facilities, collects information and makes suggestions to Gordon McClure, Assistant to the President, who makes final decision in conjunction with Guy B. Entrekin, Jr., President and Chairman.

NORTHROP CORPORATION, 1800 Century Park East, Los Angeles, CA 90067 -- (213) 553-6262

Employs 25,634. Interested in new site possibilities. Products include aircraft equipment, data systems, tactical systems, electro-mechanical equipment, architectural systems, etc. New site selection procedure -- Clark DeSpain, Director of Facilities, collects information and recommendations which he passes on to Don Warner, Vice President of Materials, Facilities and Services, who makes approvals along with top executive group.

MICOM SYSTEMS, 9551 Irondale Avenue, Chatsworth, CA 91331 -- (213)882-6890

Employs 310. Actively interested in Hawaii. Products are in data communications. New site selection procedure -- Bill Norred, President, has been in conversations with Andrew Gerakas, and would be the decision-maker.

AVANTEK, 3175 Bowers Avenue, Santa Clara, CA 95051 -- (408)727-0700

Employs 600 Looking for areas suitable for expansion. Products include wide band transistor amplifiers, r-f and i-f amplifiers, solid state replacements for YIG oscillators, traveling wave tubes, multi-couplers, microwave digital radio relay terminals, CATV test systems. New site selection procedure -- Robert Mullaley, Vice President, makes selection, along with James Dobbie, President.

WATKINS-JOHNSON COMPANY, 3333 Hillview Avenue, Palo Alto, CA 94304 -- (415)493-4141

Employs 1,500. Presently looking at new areas of expansion. Products include power amplifiers, traveling-wave tubes, automatic test equipment, solid state amplifiers, mixers, telemetry transmitters, space communications equipment, special purpose cathode ray tubes, synthesizers. New site selection procedure -- H. Edward Beckmeyer, Administrative Director, reviews possibilities and makes recommendations to H. Richard Johnson, President.

SHUGART ASSOCIATES, 415 Oakmead Parkway, Sunnyvale, CA 94086 -- (408)733-0100

Employs 800. Presently looking for expansion during 1981-82 timeframe. Products include OEM data processing products. Shugart is a division of Xerox. New site selection procedure: R.D. Riggs, Director of Facilities, selects the new sites and makes recommendations to James Bochnowski, President.

AMERICAN TELECOMMUNICATIONS CORPORATION, 9620 Flair Drive, El Monte, CA 91731 -- (213)579-1710

Employs 1,150. Presently looking at some new sites. Products include telecommunications equipment. New site selection procedure: D.A. Davidson, Vice President of Planning, looks into new site possibilities and makes recommendations to Neil Hynes, President and Chairman.

RAYTHEON COMPANY, Telecommunications Division, 1023 North Rose Glen Avenue, Rosemead, CA 91770 -- (213)283-2086

Telecommunications is a small division of Raytheon, a large company employing several thousand.